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mary purpose was to provide a compact book which would contain a summary of useful and scientific information about the plants to be "met with in a botanical garden or museum, or in the field." The second volume carries out this idea, and is a regular plant dictionary, containing a vast fund of information concerning the morphology, taxonomy, ecology, economic value, etc., of plants, arranged in the alphabetical order of their Latin names. All of the classes, cohorts, and families are included, and several thousand genera, the more important divisions being treated fully. The second volume, however, necessitated the first, which is really a brief text-book. The topics treated, as well as the motive of their treatment is suggested by the subjects of the four chapters, which are as follows : outlines of the general morphology and natural history of phanerogams and ferns; variation, evolution, classification ; forms of vegetation, geographical distribution of plants, etc. ; economic botany. A cursory examination of the pages shows that the author has brought together the most recent views upon these various subjects, treating them in a broadly philosophical yet simple way. In the chapter upon forms of vegetation and geographical distribution the author has used the same method of treatment as that of Warming in his *Ecological plant geography*, but had developed it independently. From our point of view the first volume is more important than the more extensive and far more laborious second volume, for the latter is a compiled dictionary, exceedingly useful, but the former is a well presented suggestion of a more rational style of text-book. The work is one of the Cambridge Natural Science Manuals.—J. M. C.

The physiology of reproduction.

REPRODUCTION may be reckoned as the last and highest of the life-phenomena of any organism, marking the climax of its development and often the beginning of its decline. It is no wonder, therefore, that reproduction has been much studied, and that classification is so largely based on its structures and phenomena. But most of this study has been devoted to an accumulation of facts regarding the morphology of the organs and the direct method of its accomplishment. Comparatively little is yet known of the physiology of reproduction, and almost nothing of the external conditions by which it is limited.

Using the lower organisms as a starting point, Dr. George Klebs, professor of botany in the University of Basel, has attempted to penetrate this "dark world of reproduction," as he calls it, and has succeeded, in the course of nine years of labor, in making some advance. This has been along the line of determining the conditions under which reproductive bodies, both spores and gametes, are formed.

Enough has been accomplished for the author to plan a work "Ueber die Fortpflanzungs-physiologie der niederen Organismen, der Protobionten," of which the volume before us[7] may be considered as a preliminary special part. This part is limited to a detailed account of the behavior of certain algæ and fungi under varied environment.

In order to study some of these problems it was necessary to develop the methods of obtaining pure cultures of algæ and maintaining them in vigor as well as purity, especially for those species which have no striking characteristics at certain stages by which they can be instantly identified. Both fluid and solid media can be used for cultures, and Klebs recommends that both methods be used simultaneously. As a nutritive medium fluid he finds Knop's the best. It consists of

4 parts calcium nitrate,
1 part magnesium sulfate,
1 part potassium nitrate,
1 part potassium phosphate.

In preparing it a concentrated solution (*B*) may be made of the last three salts, and another (*A*) of the first. A proper amount of *A* is to be added to *B* after dilution to the desired percentage. By this method only a small part of the insoluble calcium phosphate formed will be precipitated. Solutions containing 0.2 to 0.5 per cent. of salts were found most useful.

As solid media one may use either opaque or transparent materials. For the former sterilized sand or clay, wet with the nutritive solution, are excellent. For the latter Klebs, having discarded silicic acid, now uses agar-agar, prepared by soaking 0.5^{gm} agar-agar in 100^{ccm} of 0.2, 0.4, or even 1 per cent. nutritive solution, heating, filtering, and sterilizing. In making pure cultures of algæ it is necessary to use the same precautions as are required with bacteria and fungi.

It is impossible to go into the details of the experimentation. Klebs has studied various species of *Vaucheria*, *Hydrodictyon utriculatum*, *Protosiphon botryoides*, *Botrydium granulatum*, several species of *Spirogyra* and *Desmidiaceae*, *Œdogonium diplandrum*, *Ulothrix zonata*, *Hormidium nitens* and *H. flaccidum*, *Conferva minor*, *Bumilleria sicula* and *B. exilis*, *Stigeoclonium tenue*, *Draparnaldia glomerata*, *Chlamydomonas media*, *Hydrurus foetidus*, *Eurotium repens*, and *Mucor racemosus*. Each of these is the subject of a chapter in which the results of his extended experiments are set forth. To Vaucheria he devotes most attention as introducing the extent and methods of experimentation. Upon the sexual and non-sexual reproduction of these plants Klebs endeavored to determine the effect of such conditions as nutrition, moisture, light, temperature, chemical composition of the medium, oxygen, and flowing water.

It is easy to see that the determination of the effect of each factor, when two or more must necessarily operate, is not at all an easy problem. Of some the effect seemed to be direct; of others it was exceedingly complex, and it would be quite easy to quarrel with the analysis in some cases. With many species it became possible to produce the sex organs or the zoospores at will; and in some species even to produce male or female organs in predominance by furnishing appropriate conditions. The volume is a monument of painstaking experimentation, and, even though elaborate, by no means represents the amount of energy which has been expended upon the problems.

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[7] KLEBS, GEORGE.—Die Bedingungen der Fortpflanzung bei einigen Algen und Pilzen. 8vo. pp. xviii + 544. *pl. 3. figs. 15.* Jena: Gustav Fischer. 1896. *M* 18.

We are promised the second part "somewhat later." It is to contain a general discussion of the physiology of reproduction, based upon the researches here set forth and upon the scattered statements to be found in literature. It will be welcome, and we sincerely hope that it may be doubly welcome because supplied with an index of its own, and also one for this volume which at present is wanting. It should be made a penal offense for a publisher to issue a book without a suitable index.—C. R. B.

The Laboulbeniaceæ.

WE welcome with pleasure the magnificent monograph of Dr. Thaxter[8] upon the Laboulbeniaceæ. It is not probable that any group of fungi has been honored within recent years with such thorough and detailed study as have these forms. The Laboulbeniaceæ are parasitic fungi living upon the bodies of insects, chiefly Coleoptera and Diptera.

The paper describes and illustrates with 26 plates 152 species belonging to 28 genera, and of these less than 20 species bear the names of authors other than Dr. Thaxter. He may be said to have established this group as a very important family both in respect to its systematic position and because of peculiarities of structure and sexual reproduction that make it particularly interesting.

Dr. Thaxter has adopted a system of nomenclature such that the names of the twenty-five new genera have the same endings. The results are pleasing and the continuance of the system is greatly to be desired as new genera are added.

We also express the hope that Dr. Thaxter may be allowed to describe the new forms which may be expected to be found all over the world. There is every indication that the group will prove to be a large one and only by great care will it be kept free from the mass of synonyms that overwhelms so many groups of fungi.

The Laboulbeniaceæ are very remarkable forms in many respects. They are highly specialized parasites living under peculiar conditions attached to the bodies of active insects. But they are chiefly interesting because they

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[8] THAXTER, ROLAND.—Contribution towards a monograph of the Laboulbeniaceæ Mem. Amer. Acad. Arts and Sci. **12**: 187–429. *pl. 1–26.* Dec. 1896.